

Maths Group Activity

# Bacterial Growth Analyser Program

Presented by Indrajith Sen  
25BET10015



# Introduction

- Bacterial growth can be modeled using calculus
- Exponential model:  $P(t) = P_0 e^{(kt)}$
- We use differentiation and integration to study population behavior



# User Input Based Python Program

- User enters:
  - – Initial Population ( $P_0$ )
  - – Growth Constant ( $k$ )
  - – Start Time ( $a$ )
  - – End Time ( $b$ )
- Program computes outputs symbolically



# Differentiation

- Instantaneous growth rate:
- $\frac{dP}{dt} = k P_0 e^{(kt)}$
- Shows how fast bacteria multiply at any moment



# Integration

- Total bacteria added between  $t=a$  and  $t=b$ :
- $\int (dP/dt) dt = P(b) - P(a)$
- Measures total growth over a period



# Program Output

- Population at start time
- Population at end time
- Total bacteria added
- Fully user-driven and dynamic



# Conclusion

- Calculus helps understand biological growth precisely
- User input makes model flexible
- Useful for microbiology, research, and education